Assessment of the relationship between sleep and welfare in dogs using AWAG data

Rachel Malkani

Rachel.malkani@ivcevidensia.com

IVC Evidensia

Carrie Tooley

Behavioural Referrals Veterinary Practice

Sarah Heath

Behavioural Referrals Veterinary Practice

James Oxley

IVC Evidensia

Sarah Wolfensohn

Welfare Assessment Technologies

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Abstract

Sleep is a fundamental biological process crucial for physical restoration, emotional regulation, and cognitive functioning. However, there is limited understanding of how sleep affects welfare in dogs. This study explored the relationship between sleep duration and welfare status in dogs using retrospective data from the Animal Welfare Assessment Grid (AWAG).

Retrospective data from 105 dogs assessed between January and March 2025 were analysed. Of these, 77 dogs had recorded sleep scores. AWAG data were analysed in R Studio to examine correlations between sleep scores and cumulative welfare assessment scores (CWAS), and additionally individual factors were examined using Spearman's rank correlation and linear regression.

Most dogs (62.3%) are reported to sleep less than the recommended 14 hours per day. A significant positive correlation was found between sleep score and CWAS ($r = 0.46$), indicating that shorter sleep duration was associated with poorer welfare. Sleep score showed the strongest positive relationship with fears, anxieties, and frustrations frequency ($r = 0.92$), and moderate positive relationships with reaction to stressors ($r = 0.59$), and mobility and activity ($r = 0.43$).

These findings suggest that suboptimal sleep may be linked to poorer overall welfare in dogs, with strong associations with psychological health. While causality cannot be established, these data offer insight into canine sleep for veterinary and animal welfare professionals. Discussing sleep in consultations maybe be a valuable welfare indicator and facilitating good sleep environments may promote better welfare in dogs.

Introduction

Sleep can be defined as a state of immobility with greatly reduced responsiveness, which can be distinguished from coma or anaesthesia by its rapid reversibility. Sleep is a fundamental biological process that serves essential restorative and regulatory functions across mammalian species. Rather than representing a period of inactivity, sleep is a neurophysiological state supporting energy conservation, cellular repair, and neural plasticity (1).

Interest in the role of sleep in physical, cognitive and emotional health in canine patients has increased significantly in recent years (2–5). There is a wealth of evidence in human healthcare of the importance of both duration and quality of sleep (6). From a physiological health perspective in humans, sleep disturbances correlate with fluctuations in function of the immune system, cardiac, hormonal and metabolic health (7, 8) Sleep disturbances have also been shown to correlate with human emotional and cognitive ill-health (9, 10). In particular, rapid eye movement (REM) sleep in humans is reported to promote emotional and social functionality (6). Reduced REM sleep leads to increased stress and anxiety in response to mildly aversive stimuli (11) and an increased intensity of negative/protective emotional arousal (12). The relationship between sleep quality and management of chronic pain is

discussed in both human and veterinary species, with analgesia shown to improve sleep quality in dogs (13) and pain acknowledged as both cause and outcome of sleep deficiency in humans (14)

Research into canine sleep for the purpose of improving the health and welfare of canine patients is in its infancy. Several studies have shown that dogs need significantly longer duration of sleep than humans (15). Optimal sleep duration for an adult dog is thought to be 14–18 hours per day (2, 4, 15, 16). In the authors' experience, these durations can come as a shock to some caregivers. Decreased daily sleep duration, and in particular poor sleep quality (for example, frequently disturbed day time sleep), correlate with worsening problem behaviours (5). Worsening problem behaviours are often an outward clinical sign of an underlying compromise in welfare (17)

Optimising welfare in domestic dogs is a primary focus for many veterinary professionals. The field of veterinary healthcare is constantly evolving as our understanding of the influences of different diets, routines, exercise regimes and other factors, and their influence on health improves. The welfare of an individual patient is influenced by their physical, cognitive and emotional health (18) and can be measured by tools such as the Animal Welfare Assessment Grid (AWAG) (19, 20). The AWAG is a valid and reliable tool used to assess and quantify the welfare of an animal. It is a novel tool used by veterinary and welfare professionals (alongside owners where applicable) assessing various factors related to the physical health, psychological health, the environment and any procedural and management events undertaken in relation to the animal (21). This AWAG is designed to be scored longitudinally to identify where an individual animal may be experiencing compromised welfare, which allows for intervention to improve welfare. In addition to the use of AWAG as a longitudinal tool for tracking the welfare of an individual through time, it can also be used at population level to draw associations between a particular management parameter and the cumulative welfare assessment score (CWAS) (22).

An exploratory study using retrospective AWAG scores to examine the relationship between sleep and welfare in dogs was conducted. The aim of this study was to explore the relationship between a dog's overall welfare status, as quantified by the CWAS, and their sleep scores. Additionally, the study examined correlations between the scores of each individual factor (Table 1) and sleep scores.

Table 1
Factors assessed in dogs in the AWAG

Parameter	Factor
Physical	Body condition
	Clinical assessment
	Eating and drinking
	Mobility / Activity
	Sleep
Psychological	Aggression towards people
	Fears, anxieties, and frustrations frequency
	Response to stressors
Environmental	Choice, control, and predictability
	Enrichment
	Social interactions
Procedural	Behaviour during assessment
	Change in daily routine
	Handling during assessment
	Procedure pain

Materials & Methods

Ethics

The retrospective data collected using the AWAG was reviewed and given a favourable ethical opinion by NASPA (Non-ASPA) (FHMS 20–21 182 EGA) at the University of Surrey. NASPA is a sub-committee of the Animal Welfare and Ethical Review Body (AWERB). Informed consent was obtained from both clinicians and the caregiver.

As no experimental procedures were performed and only retrospective, anonymised data were analysed, no additional regulatory approval was required.

Data

This study used anonymised retrospective data collated through the AWAG database of dogs assessed in 2025 by veterinary clinicians and welfare professionals in veterinary consultations, shelter environments, and assistance dogs from 1 January 2025 to 27 March 2025. A total of 105 dogs were

included in the analysis; however, only 77 dogs had sleep scores recorded. Sex and age data can be seen in Table 2 and 3. Where dogs had multiple assessments undertaken, data from their first assessment were used.

Table 2
Sex distribution of dogs (n = 105)

Sex	n
Female	33
Female Neutered	21
Male	31
Male Neutered	20

Table 3
Age distribution of dogs (n = 105). 24 dogs had no age entered into the AWAG site.

Age	n
0	1
1	28
2	30
3	11
4	2
5	3
6	2
7	2
8	1
14	1

When using the AWAG, users score each factor from 1 (indicating best welfare possible) to 10 (indicating worst welfare possible). Each score is accompanied by a written descriptor that is mutually exclusive from the other scores to make assessments as objective as possible. Sleep scores can be

seen in Table 4. Once the user has scored all factors, the AWAG calculates a (CWAS) and a mean score for each parameter (21).

Table 4
Sleep factor scores and the written descriptors in the AWAG

Sleep as opposed to rest over 24 hours.
1. Over fourteen hours sleep daily
2. Over twelve hours sleep daily
3. Over ten hours sleep daily
4. Over eight hours sleep daily
5. Under eight hours sleep daily
6. Under six hours sleep daily
7. Under four hours sleep daily
8. Under two hours sleep daily
9. Under one hours sleep daily
10. No sleep

Data analysis

All data analyses were conducted using R statistical software (version 4.4.3). The associations between CWAS, factors scores, and sleep scores were analysed using Spearman's rank correlation due to the non-normal distribution of data. A linear regression model was fitted with the CWAS as the response variable and sleep score as the exploratory variable to assess the predictive value of sleep on CWAS.

To examine differences in sleep duration between sexes, Kruskal Wallis tests were performed.

Results

Of the dogs assessed, 37.7% reported as getting over 14 hours sleep; however, only 6.5% and 5.2% of dogs are getting over twelve and ten hours sleep respectively. The proportion of dogs getting over eight hours sleep is 23.4% and under eight hours is 19.5%. Dogs getting under six hours and under four hours is 3.9%. If the optimal sleep duration is over 14 hours, 62.3% of dogs assessed are getting suboptimal sleep (Fig. 1).

There was a significant positive correlation between sleep score and CWAS ($r = 0.46$), suggesting a moderate association between sleep and cumulative welfare assessment score (Fig. 2). The linear

model demonstrated that for each point increase in sleep score, the CWAS increased by approximately 3.66 suggesting that poorer sleep was associated with decreased overall welfare.

Spearman's correlation analysis of the individual factors demonstrated that sleep score was strongly and positively associated with the fears, anxieties, and frustration frequency score ($r = 0.92$) (Fig. 3). Reaction to stressors ($r = 0.59$), mobility and activity ($r = 0.43$), choice, control, and predictability ($r = 0.39$) were moderately correlated with sleep, and clinical assessment ($r = 0.36$) was also weak to moderately correlated with sleep (Fig. 4).

A Kruskal-Wallis test found no differences between sex and sleep duration (chi-squared = 6.4531, df = 3, p-value = 0.09).

Discussion

This study provides new insight into the relationship between sleep duration and welfare scores in dogs using retrospective data from the AWAG site. The findings highlight an association between shorter sleep duration and poorer cumulative welfare assessment score (CWAS). This initial data analysis also suggests that there is a strong relationship between shorter sleep duration and negative/protective emotional states.

The majority of dogs assessed were not getting what is considered an adequate duration of sleep, with 62.3% sleeping less than the recommended 14 hours per day. This finding is concerning given that optimal sleep duration is integral to facilitating memory consolidation, learning, and emotional regulation, while disruption of normal sleep patterns leads to impaired cognitive performance, increased stress reactivity, and reduced emotional stability (1). Physiologically, insufficient sleep has been associated with hormonal imbalance, immune compromise, and reduced capacity to recover from stress or disease (23). This shows that sleep is integral not only to physical health, but also to emotional resilience, which highlights the critical role of sleep in maintaining overall welfare in mammals. Additionally, poor sleep in humans is known to reduce prefrontal regulation of limbic activity, resulting in heightened emotional reactivity and anxiety (24)

The moderate positive correlation (r = 0.46) between sleep and CWAS indicates that dogs with longer sleep durations (up to the maximum duration assessed in this study of 14 hours) have overall better welfare scores. These results are consistent with the broader literature, where limited sleep duration has been linked to impaired coping strategies, cognitive deficits, and reduced quality of life in humans (25). The relationship may not remain linear when excessive sleep durations are considered. In a study correlating sleep duration with caregiver reported severity of problem behaviours in dogs, canine sleep durations of over ten hours whilst a caregiver was in bed themselves correlated with increased problem behaviour scores (15)

Similar findings have been observed in rodents where sleep deprivation is associated with negative emotional states such as depression (26) and total REM sleep deprivation, with no restriction to non-

REM (N-REM) sleep, resulted in death (27). This is likely the same in dogs, where insufficient or fragmented sleep could reduce their ability to recover from emotional arousal. In particular, when we consider that REM sleep cannot occur without the previous phases of N-REM sleep, fragmented sleep may selectively reduced REM sleep durations over N-REM sleep durations. With REM sleep considered the primary phase in which emotional regulation is achieved, fragmented sleep can therefore have a very significant impact on emotional health and welfare.

The strong association between lower sleep durations and the frequency at which the dog experiences fears, anxieties and frustrations ($r = 0.92$) suggests that negative/protective emotional states may be strongly related to impaired sleep duration. Sleep disturbances have been shown to exacerbate negative affect in humans. In dogs, this may present as an increased emotional response to stressors or reduced tolerance for frustration which may in turn worsen sleep. Poor-quality or insufficient sleep may compromise a dog's ability to recover from emotional arousal, causing chronic mental and physiological impacts.

Moderate correlations with reaction to stressors, mobility and activity, and choice, control, and predictability provide further support that sleep has an influence or is influenced by both physical, psychological, and environmental welfare domains. Interestingly, the correlation between clinical assessment and sleep was weak to moderate, suggesting that although physical health is associated with sleep duration, other emotional or environmental factors may have a more immediate impact on sleep duration in dogs. Nonetheless, it is well established that pain and disease can disrupt sleep (28, 29) and this may indicate that some dogs with poorer clinical scores experienced disturbed or fragmented sleep rather than reduced total duration, which is not currently captured within the AWAG. Additionally, dogs with illness may be lethargic and sleep longer, potentially biasing AWAG scores.

These findings have important practical implications for welfare assessment and management. The findings from this study suggest that sleep in dogs is more strongly influenced by behavioural and emotional factors rather than physical health alone. While correlations between sleep and mobility and activity were moderate, the strongest relationships were indicative of negative and protective affect. This may suggest negative emotional arousal and having control over the dog's environment may have substantial role modulating sleep. From a clinical perspective, this highlights the importance of recognising emotional and cognitive welfare as facilitating good sleep and overall welfare.

Incorporating sleep duration or quality measures into welfare monitoring systems such as the AWAG can provide clinicians and animal welfare professionals with an additional, non-invasive indicator of welfare status. Regular observation or simple wearable technology could be used to identify some dogs experiencing sleep disruption, allowing early intervention. Changes in sleep or other physiological factors measured could alert caregivers to underlying illness that may not be noticed by the owner.

Improving sleep environments using predictable routines, calm environments, comfortable rest areas, appropriate caregiver interactions and careful management of a dog's expectations could play a meaningful role in improving overall welfare status.

Limitations

We need to acknowledge the limitations of this study. The sleep data are owner-reported rather than objective measures; thus, owners may inaccurately report their dog's sleep. Additionally, as correlations suggest associations, causality or directionality cannot be established; poor welfare may also disrupt sleep, creating a bidirectional relationship. It is possible there are underlying mutual causes for both factors such as chronic pain or environments that are not optimised for sleep (15). Within this dataset are dogs housed in varying environments and dogs in the kennel environment may have environmental and emotional challenges that influence sleep and welfare outcomes such as constant exposure to noise and/or artificial light (30, 31).

As this is a retrospective study with a relatively small sample size (n = 77), this limits the generalisability of findings, and replication with larger, prospective methodologies is required with clear defined inclusion criteria. With a larger dataset, analyses incorporating variables such as clinical conditions and breed will provide better quality data and findings.

Another limitation is that where one represents the optimal sleep duration within the AWAG tool (over fourteen hours of sleep daily), increased sleep duration does not always equate to good welfare. In some cases, prolonged sleep may be indicative of underlying health issues. Therefore, while shorter sleep durations were associated with poorer welfare in this dataset, excessive sleep should also be interpreted cautiously. However, this potential limitation may be somewhat mitigated by the physical parameter in the AWAG, which captures indicators of disease, pain, or reduced physical health. Dogs with increased sleep duration due to illness or pain would likely also score higher (indicating poorer welfare) in the physical health. This may explain why the correlation between sleep and physical health factor scores were moderate rather than strong.

Nonetheless, these data are important as it may highlight that sleep is closely related to animal welfare and emotional state. Whilst the findings must be interpreted cautiously, they represent emerging evidence that sleep is recognised in humans and other animals as a fundamental need that influences both physical and psychological health.

Declarations

Funding

No funding was obtained for this study.

Clinical trial number: not applicable.

Consent to Participate declaration: not applicable

Consent to Publish declaration: not applicable.

Ethics

The retrospective data collected using the AWAG was reviewed and given a favourable ethical opinion by NASPA (Non-ASPA) (FHMS 20-21 182 EGA) at the University of Surrey. NASPA is a sub-committee of the Animal Welfare and Ethical Review Body (AWERB). Consent was obtained from both clinicians and the caregiver.

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Figures

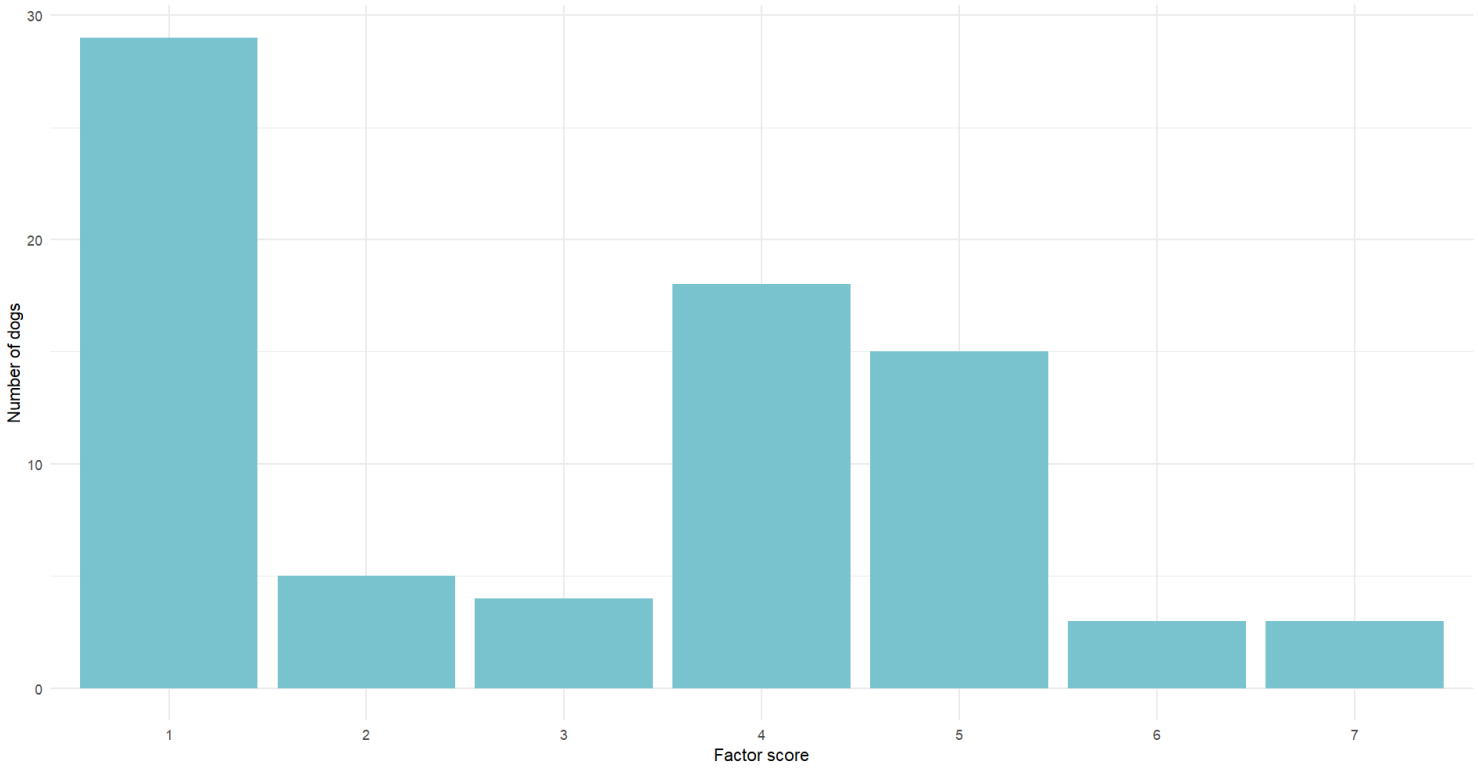

Figure 1

The number of dogs that reported each sleep score. 0 respondents reported scores 8, 9 and 10

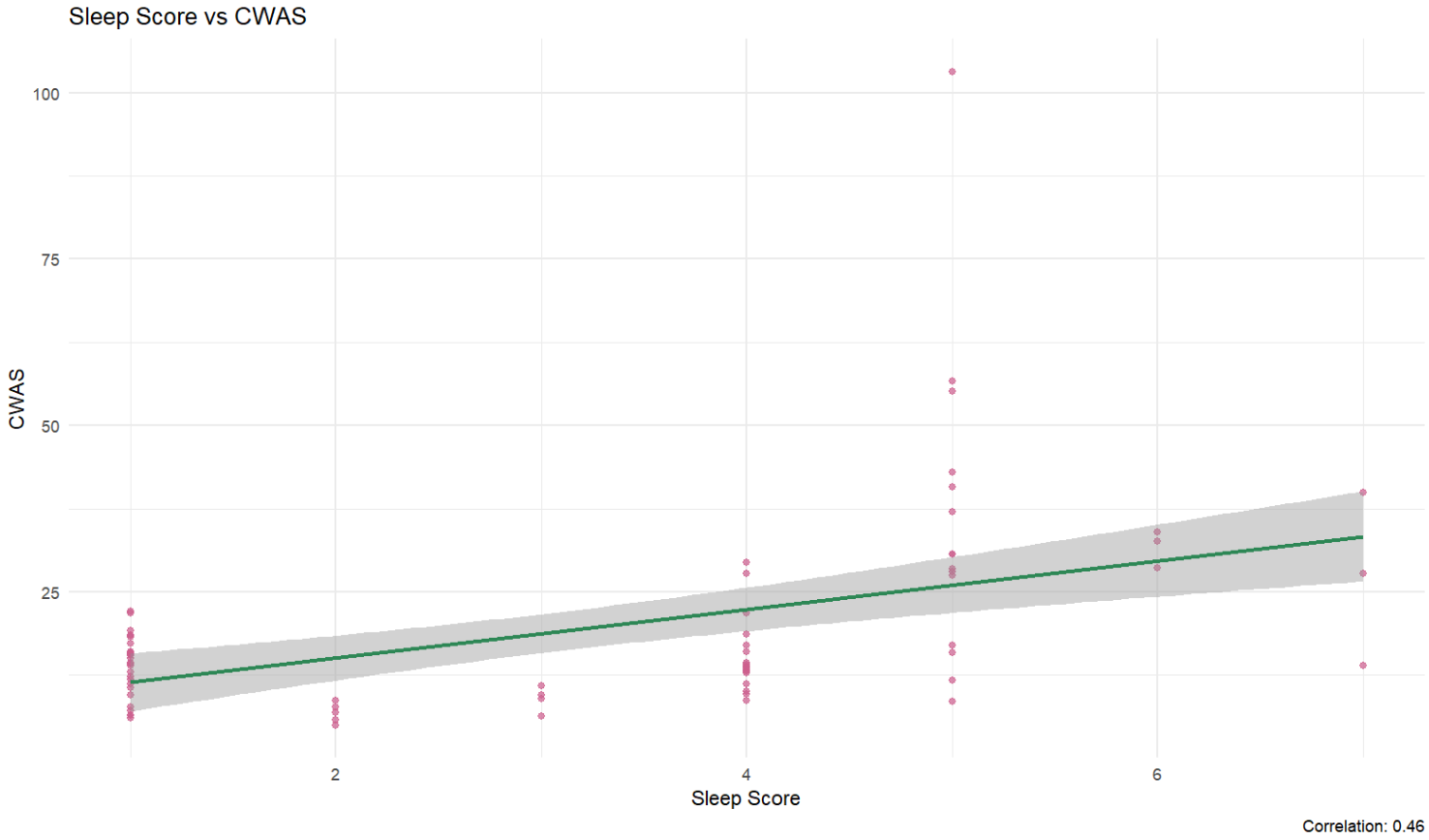

Figure 2

Scatter plot of positive relationship between sleep score and cumulative welfare assessment score (CWAS) in dogs with linear regression line (lower CWAS = better welfare). One is highest duration of sleep (>14 hours) and ten is the lowest (no sleep).

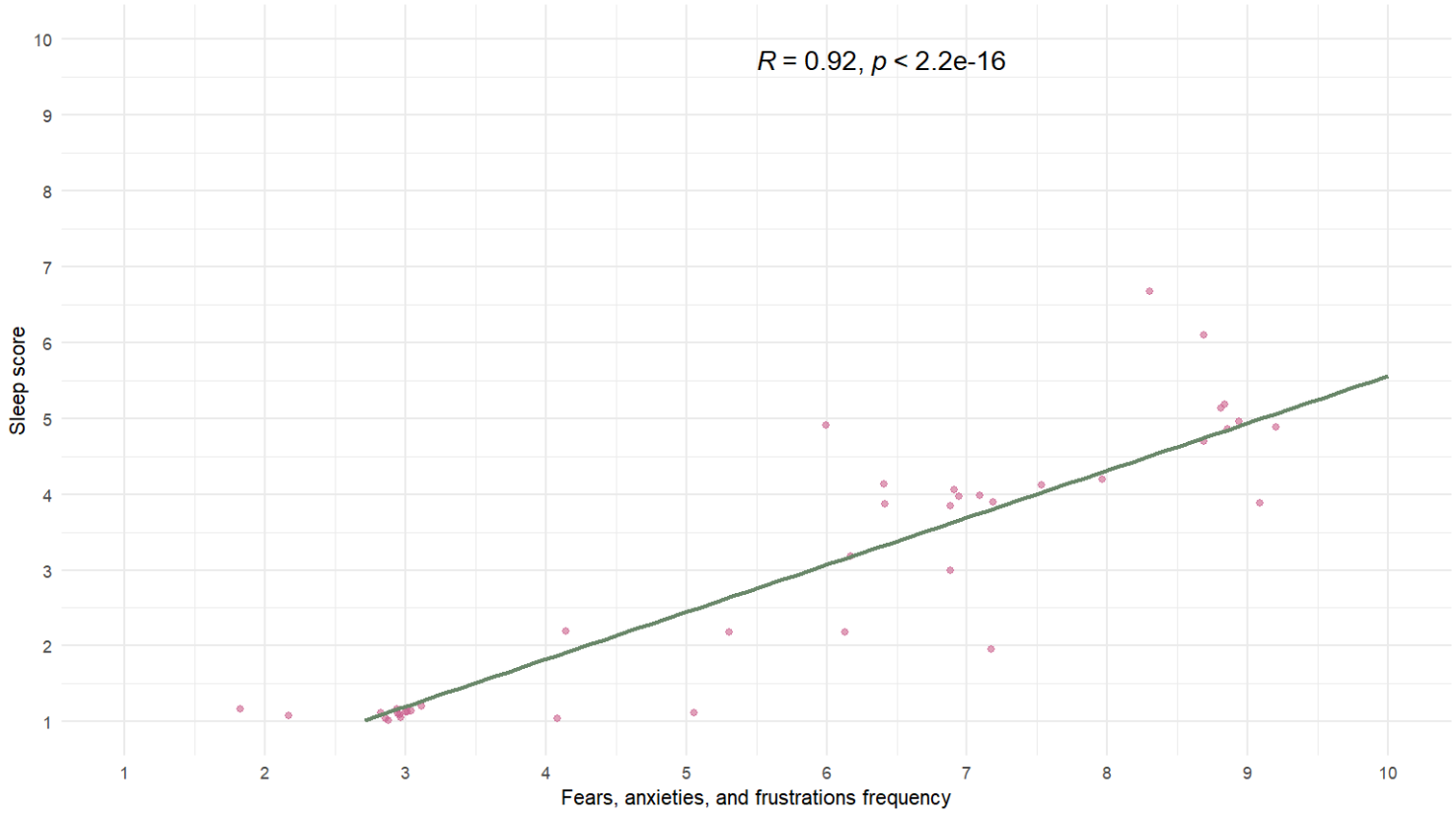

Figure 3

Scatter plot of positive relationship between frequency of fears, anxieties, and frustrations score and sleep score in dogs with linear regression line.

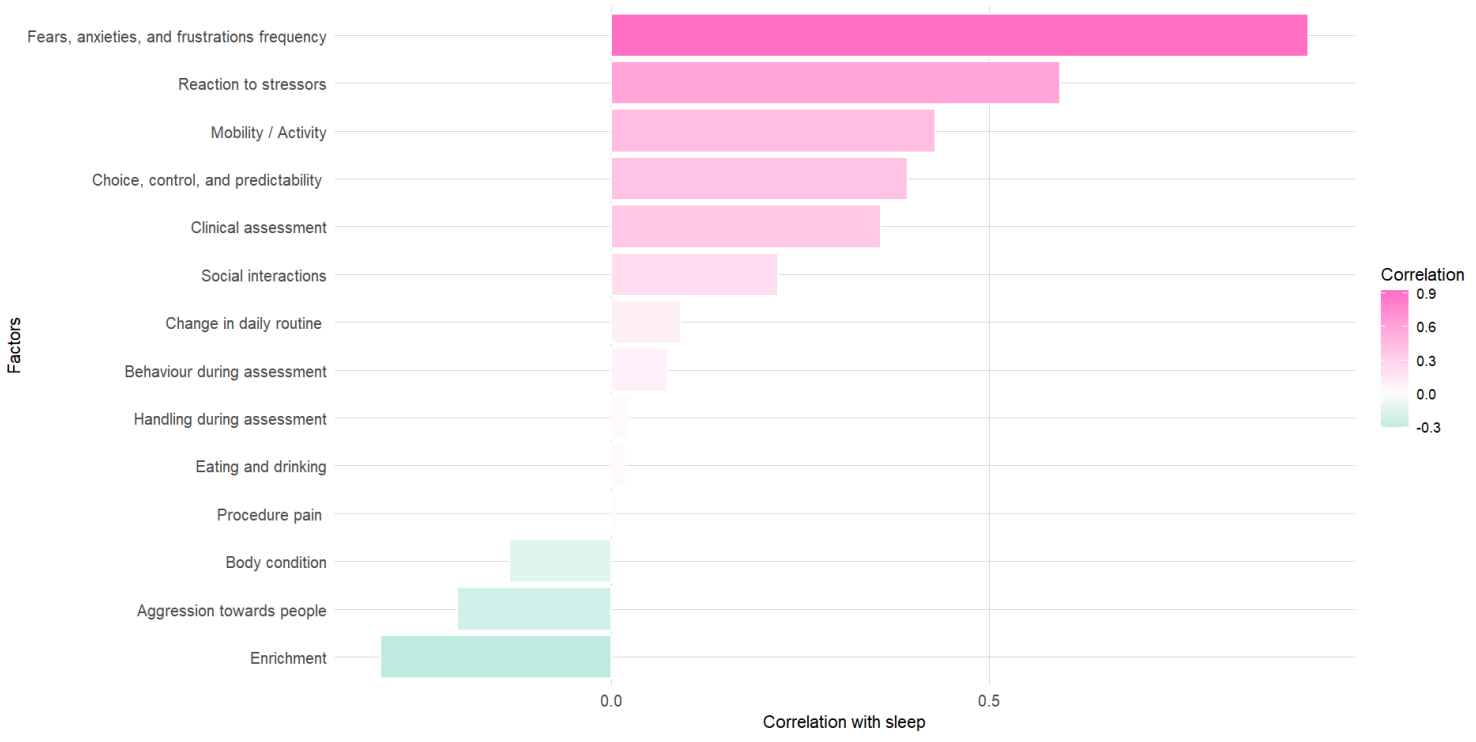

Figure 4

Correlation plot of AWAG factors and their relationship with sleep